

# AGRICULTURAL NEWS LETTER

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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigators at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.



ISSUED BY PUBLIC RELATIONS DEPARTMENT, E. I. DU PONT DE NEMOURS & CO. (INC.), WILMINGTON 98, DEL.



### MORE HAY AND PASTURE PLANTS IN NATIONWIDE CHEMICAL TESTS

Seed treatment for grass and legume seeds accounted for increased numbers of hay and pasture plants in 134 farm fields in 28 states, from Vermont to California and from Georgia to Oregon, during the summer of 1952.

The fields were part of a nationwide experimental program in which farmers cooperated with representatives of the Du Pont Company to test the chemical treatment of forage crop seeds under actual farm conditions.

In each case, the same seed was used throughout the field, with the chemical treatment applied to seeds sown in half the field and the remainder planted without treatment.

#### Eleven Forage Crops Tested

Eleven different forage crops were involved in the tests. When plants had emerged and were in a healthy growing condition, farmers, county agricultural agents, soil conservation workers and others interested in the experiment accompanied Du Pont field representatives in making actual counts of the number of plants in parallel areas throughout treated and untreated sections of the fields. While differences in stand varied depending on the area where crops were planted, amount of rainfall and soil moisture and cultural practices, the following table shows that increased stand in favor of seed treatment was impressive throughout the country:

<u>Crop</u>	<u>No. Tests</u>	<u>Avg. Increase in Stand</u>
Alfalfa	60	32%
Red Clover	27	61%
Crimson Clover	3	19%
Sweet Clover	4	108%
Ladino Clover	2	3%
White Clover	2	5%
Birdsfoot Trefoil	2	65%
Lespedeza	11	53%
Legume Mixtures	11	22%
Sudan Grass	7	30%
Miscellaneous Grasses	5	42%

#### Some Spectacular Results Reported

The chemical used was "Arasan" seed disinfectant, an organic sulfur compound. It acts as a protectant for the tiny seed and seedling against the attack of disease organisms in the soil or on the seed coat which can produce seed rot, seedling blight, or "damping off." Without chemical protection, a large percentage of all seeds planted may succumb to these diseases and never reach maturity.

Some of the increases in stand were spectacular. At Lander, Wyoming, Allen Cornwell found that treated seed produced 249 percent more sweet clover plants

than did untreated seed. At Anderson, S. C., treated lespedeza seed on the farm of Harry Drake gave 212 percent better stand than untreated seed. J. H. Kent at Columbus, Miss., saw a 186 percent increase in plants from treated seed of Kentucky 31 fescue grass as compared with the untreated section of a pasture planting, vitally needed in this drought year. At Olathe, Kansas, seed treatment produced 123 percent more birdsfoot trefoil plants for S. R. Hutcheson. Rew Bergoin of Malvern, Iowa, showed a 115 percent increase where treated seed was sown in a red clover field.

The most commonly tested crop was alfalfa. Top increases in this important hay crop were shown at Malvern, Iowa, where C. K. Stewart had a 118 percent increase in stand in favor of seed treatment; at Barnsville, Minn., where a 112 percent increase was chalked up in the field of Harold Janneck; and in Turlock, Calif., where seed treatment produced a 101 percent increase for T. C. Dilworth.

#### Faster Growth of Alfalfa Noted

Increased stands did not tell the entire story of the value of treating the seed with "Arasan" seed disinfectant. Since the chemical allowed the plant to get its start in life free of disease onslaughts, healthier root systems and faster growth were frequently noted in comparison with plants from untreated seed. In cases where the crop is raised for hay, this can mean more bales per acre. In Pennsylvania, Oklahoma, and California, alfalfa growers have harvested a third more hay from treated sections of their fields, and in two cases where the fields were planted in 1951, this increase has carried over into the second year.

The 1952 tests constituted the third series of actual farm trials which have been used to evaluate seed treatment of forage crops. First tests were conducted in the summer of 1951. Second group of trials took place in Southern states with crops which were seeded in the fall of 1951 and evaluated when the stand was complete in the spring of 1952. Throughout all three series, the results have been consistently in favor of seed treatment to assure a thicker stand of healthier plants.

The total number of tests conducted now stands at 231, with the following results in terms of increased stands from treated seed:

<u>Crop</u>	<u>No. Tests</u>	<u>Avg. Increase in Stand</u>
Alfalfa	91	32%
Sweet Clover	13	44%
Red Clover	30	57%
Miscellaneous Clovers	14	34%
Birdsfoot Trefoil	4	31%
Lespedeza	14	65%
Vetch	3	33%
Legume Mixtures	22	34%
Sudan Grass	14	41%
Ky. 31 Fescue	11	59%
Miscellaneous Grasses	15	25%

MOVIE "THE DU PONT STORY"  
AVAILABLE ON LOAN

A feature-length 16mm. sound film, "The Du Pont Story", is now available to clubs, schools, and colleges. There is no charge to borrowers, who pay only the return postage.

This picture was made in Hollywood, in Technicolor, and was called "one of the most unusual industrial motion pictures ever made" by one reviewer. It presents the highlights of the history of the Du Pont Company from its founding in 1802 to the present day, and shows the parallel between the company's progress and growth of the nation. Running time is 72 minutes.

Stars of the film are Eduard Franz, Sigrid Gurie, Donald Woods, Lyle Talbot, Stacy Keach and Tom Neal. In modern scenes, a few Du Pont officials play their own parts. The film was directed by William J. Thiele.

If you would like to show this picture to a group, just drop a card or letter to the Editor of the AGRICULTURAL NEWS LETTER, Wilmington 98, Delaware. Please write at least a month in advance of the show-date you plan, and also give second and third date preferences, should it be impossible to make the film available for the first date.

NEW BACON PACKAGE

The Deerfoot Farms Co., of Southborough, Mass., took a tip from the ladies and is packaging a half pound unit of bacon in half-slices.

This revolutionary package was featured by the Du Pont Film Department at the convention of the American Meat Institute, held in Chicago last fall. Stressing consumer convenience, the new unit is based on a design developed by Du Pont packaging specialists, who incorporated many of the ideas revealed by a consumer survey.

This Du Pont survey, which polled women from 28 states, disclosed that a majority of those interviewed preferred bacon in half-slices. Forty-four percent of the women said they always cut their bacon in half-slices before cooking.

### RUBBER IN FARM MACHINERY MAY HAVE ADDED WEATHER RESISTANCE

The prospect of longer lasting and improved rubber products was held out by a team of Du Pont chemists recently.

They told a session of the Division of Rubber Chemistry of the American Chemical Society at Buffalo, N. Y. that a new Du Pont rubber-like material looks like the answer to a primary cause of deterioration in natural and many types of synthetic rubbers. The material, known as "Hypalon" S-2 chlorosulfonated polythene, was introduced by Du Pont a few months ago and is being made in semi-commercial quantities at Belle, W. Va.

The scientists were Robert T. Currin, Ward J. Remington, William B. Clark, John J. Ondrejcin, and George H. Bowers, all members of a research team from the company's Polychemicals Department Research laboratory at Wilmington, Del. They pointed out that cracks in automobile tires and in other rubber products exposed to the weather result principally from the attack of ozone, a highly active form of oxygen which usually is present in the atmosphere in amounts less than ten parts per 100 million.

#### Material Has Great Ozone Resistance

The weather resistance of rubber parts for farm machinery and other equipment which must be stored outdoors would be greatly improved by blending the rubber with "Hypalon" S-2, the chemists observed. Other promising uses, they said, would be in conveyor belts, wire covering, engine mountings, unsupported hose, and many types of mechanical rubber products.

"Hypalon" S-2 has been exposed in the laboratory to air containing more than 1,350 times this amount of ozone without showing a single crack, and, in fact, has never been found to fail in ozone, the chemists said.

A rubber widely used in automobile tires, blended with 25 per cent of the Du Pont material and put under strain comparable to that in a tire sidewall, showed no sign of cracking after four months' exposure to a degree of ozone concentration found only in a few sections of the United States. Under corresponding conditions, the same rubber, without "Hypalon" S-2 in it, showed ozone cracks within 24 hours, as did natural rubber.

Even when the 75-25 blend of the tire-type synthetic and the Du Pont material was subjected to an ozone concentration about 400 times greater than that ever found outdoors, there was no failure.

This and other demonstrations of the outdoor durability of the "Hypalon" S-2 blends, plus the fact that many of them remain flexible at low temperatures, led the chemists to suggest their use in door and window stripping for airplanes as well as for similar parts in automobiles where cracking has long been a problem.

WORKING TIME REDUCED IN  
HALF BY MODERN MACHINERY

Fear of modern technology and misunderstanding of its productive role underlie much of the world's current uneasiness, a Du Pont Company official told a group of educators in Washington, D. C., recently.

Henry B. du Pont, a vice-president of the Du Pont Company, speaking at the convention of the Association of Land-Grant Colleges and Universities, urged college professors to "spend some time with a modern industrial organization" as a means of appraising industrial developments realistically.

"Technology is everybody's rich uncle," Mr. du Pont said. But he noted that "the fruits of technological progress reach the public through the medium of American industry" and that thorough understanding of all financial, technical and economic requirements are essential. Technology and industry "are almost synonymous," he said. "To praise technology and condemn industry...is like favoring education but condemning the university."

Twentieth Century Paradox

The colleges, he said, can clarify much of the misunderstanding of this process by broadening the educational background of both students and faculty. Social scientists in the universities, he said, often lack sufficient technical background to follow industrial developments, while engineers and physical scientists must "learn to evaluate the human aspects of our civilization."

The paradox of the Twentieth Century, Mr. du Pont noted, is that despite all of our progress, "we still find ourselves uneasy, dissatisfied, uncertain of the future." There are many viewpoints as to the cause of this but "underlying each of them is a basic and very real misunderstanding--misunderstanding of the role of technology in modern life. And because of this misunderstanding there is suspicion, and fear, fear of the machine, fear of change, fear that a few large corporations could, through their technology, dominate our whole economy.

Things Different in Agricultural Economy

"These fears and conflicts arise directly from our technological progress. In the days when we had mainly an agricultural economy, a man could see and depend on the results of his own labor. The same was true of our early artisans, owning their own simple tools. But today the tools of industry are so complex and expensive that no one man can furnish the funds to provide them or supply the many specialized skills and talents necessary for their operation. In our company, for example, the investment works out to something like \$18,000 per employee, and the plant in which he works may cost as much as \$100,000,000. We have 140,000 stockholders, and we employ hundreds of different types of specialists and technicians. So today the worker is dependent for his well-being on the cooperative efforts of many people whom he seldom sees and doesn't know -- and is therefore likely to misunderstand and distrust," Mr. du Pont added.

He found that "technical considerations and the part that technology plays in our lives are frequently overlooked," but declared: "To misjudge technology, the most significant force of the age, is to turn our backs on the future."

#### Misunderstanding of Technology Widespread

He pointed out that the fear and misunderstanding of technology are found not only in education but other fields as well, particularly in government attitudes toward industrial development.

By way of example he said that the Du Pont Company is now building a \$40,000,000 plant to manufacture "Dacron" polyester fiber, a new synthetic fiber climaxing a research and development program going back nearly 20 years. This was a task "which could be done only by a firm having large resources," he said, and to contend that "the size of a corporation should be limited, is to argue that the public should not be permitted to benefit from such technology."

Another fear is that advancing technology leads to monopolies and greater concentration within industries while "as a matter of fact industry is growing more competitive and not less," Mr. du Pont said. As the result of technological advances, there is "competition from a steadily increasing number of products, processes and materials in different industries that compete with each other."

Technology does create problems and obviously creates change, he commented. "It is the greatest revolutionary in history, for it has had a more profound effect upon social custom and social reform than any legislation or any code of law."

#### Farmers and Laborers Hours Reduced

As a result of modern machinery created by technology, the average man today spends only about half as much of his life working as did his counterpart of 100 years ago, he said.

"A hundred years ago, the average American workman had a few simple hand tools and for power he was limited to his own muscles, plus the help of domestic animals and water wheels. He worked from the time he was through with his elementary schooling until he died. Assuming that he survived for the Biblical three-score-years-and-ten, he probably spent a total of 56 years on the job, 72 hours a week, 52 weeks a year. Add this up, it comes to something like 180,500 hours of his life.

"The average workman today, with modern machinery and equipment, probably works from the age of 19 to the age of 65, or 46 years. He works only 40 hours a week, and has at least two weeks vacation. When you total this, you find he works over his productive life less than 90,000 hours -- or about half of the time put in by the 1852 worker, and he performs his duties in greater ease, safety and comfort.

"The reason, of course, is advancing technology. It has been estimated that every horsepower of mechanical or electrical or chemical energy put at his disposal multiplied his own efforts 22 times. He doesn't work shorter hours because some benevolent law permits it. He works less hours only because with modern machinery he can out-produce his grandfather many times over."

**RESEARCH FOR CONTROL OF  
HORN FLIES MAKES PROGRESS**

Progress in research for the control of flies attacking livestock has been especially pronounced in the case of horn flies, according to Gaines W. Eddy, entomologist of the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture. He is in charge of the research on flies affecting livestock at the Bureau's laboratory in Kerrville, Texas.

In an article on "Flies on Livestock," in the new book "INSECTS - The Yearbook of Agriculture 1952," he describes old and new methods of fighting these insects which constitute an important problem in southern Texas and Florida. It is estimated that large numbers of flies attacking dairy cows can reduce milk production by 10 to 20 per cent, or can prevent gains of as much as half a pound per day on beef cattle.

"Research on the control of flies attacking livestock has progressed considerably since 1945," Mr. Eddy said. "Most progress has been made against horn flies -- in 1940, for example, the control measures employed against them consisted of destruction of larvae in the manure and the use of fly traps and pyrethrum oil sprays against adults." While sprays afforded protection for only a few hours in those days, today they afford control for about three weeks, with one spraying.

**Methoxychlor Recommended for Dairy Animals**

Mr. Eddy makes the following recommendations for spraying:

"Methoxychlor is recommended for use on dairy animals at a concentration of 0.5 to 1.0 percent. To prepare the lower concentration, use 8 pounds of a 50-percent wettable powder to 100 gallons of water, or 16 pounds (2 gallons) of a 25-percent emulsion concentrate to 100 gallons of water. About 2 quarts is enough to spray an animal of average size. It will protect the animals for about 3 weeks. If a higher concentration is used, reduce the amount of spray proportionally.

"Pyrethrum sprays also can be used effectively and safely on dairy animals to control horn flies, but more frequent treatments are necessary. DDT is not recommended for use on dairy animals."

On beef or range cattle, or on cows that are not being milked, Mr. Eddy recommends several insecticides in addition to methoxychlor. "DDT or TDE at 8 pounds of 50-percent wettable powder to 100 gallons of water are effective. Several different emulsifiable concentrates of toxaphene are also available. The manufacturer's directions for mixing and applying them should be followed closely. All four insecticides are effective. One spraying normally should protect the animals for about 3 weeks.

"No special spray equipment is needed for applying insecticides to cattle to control the horn fly. High-pressure spraying is unnecessary. The number of animals to be treated largely dictates the type of sprayer."

# GREASING ELIMINATED IN BAKING PANS USING NON-STICKING FINISH

Du Pont is meeting sizeable production schedules on a unique kind of paint with a name equalled only by its \$75 a gallon cost - "Teflon" polytetrafluoroethylene finish.

Practically nothing will stick to this finish. It is being tested as a coating on bread baking pans because the pans require no greasing before each bake. Elsewhere in bakeries where dusting with flour has been required to prevent dough from sticking, "Teflon" has solved the problem and increased output in doing so.

Engineers, particularly in the packaging industry or wherever adhesives are used, have long been occupied with the problem of glue sticking to machine parts preventing accurate and efficient operation.

A similar headache exists where sticky substances such as powdered soap, rubber, candy, and frozen foods are apt to cling to the smoothest metal surfaces. "Teflon" finishes seem to be the cure to these troubles - cheap even at 29 cents per tablespoonful.

The finish is a water suspension of a Du Pont-invented plastic which has such a high chemical, heat, and moisture resistance it is also used to prevent corrosion of equipment and as electrical wire insulation. It is an expensive material to produce and will probably never reach a price level that would qualify it as a consumer product. Moreover, the finish must be fused at about 750 degrees F. in special equipment.

Consumers may benefit in scores of possible applications now under study such as muffin pans, funnels, rolling pins and measuring cups. Heat-sealers for freezer packages coated with "Teflon" have already been introduced.

## BOOKS AT 330 PER MINUTE

One reason why it is possible to sell over 230 million pocket books annually in the United States is a new synthetic resin backbone for books which permits mass production.

The new "hot melt" type adhesive, developed by the Du Pont Finishes Division, takes seconds to dry, as against hours for animal glue which it replaces, thus removing a long-standing bottleneck in bookbinding.

Today, one leading printing company is capable of pouring forth a torrent of pocket books at the phenomenal rate of over 20 thousand an hour, or over 330 books a minute from a single binding machine -- more than twice as fast as was possible with old-style glue.

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The following article appeared in October in THE CORN BELT FARM DAILIES, a chain of publications headquartered at the four top livestock markets of the nation. The individual papers represented are the CHICAGO DAILY DROVERS JOURNAL, OMAHA DAILY JOURNAL-STOCKMAN, ST. LOUIS DAILY LIVESTOCK REPORTER, and KANSAS CITY DAILY DROVERS TELEGRAM. It is reprinted here with permission of Charles Snyder, editorial director of THE CORN BELT FARM DAILIES.

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## CHEMISTRY AND THE STOCKMAN

By R. M. Roberts

A new chemical is born! One of the myriad compounds out of a research laboratory is discovered to have outstanding properties as a stabilizer in the manufacture of explosives. Later this same chemical is found to be a valuable reagent in the processing of rubber.

What possible interest can this be to the stockman?

Well, investigators in the U. S. Department of Agriculture's Animal Industry Division, searching for something which will kill screwworm larvae in wounds of livestock, get samples of this chemical. They combine it with a petroleum derivative known as benzol and add lampblack to thicken it into a paste. Even where sizable worms have developed, they find this chemical combination will penetrate to the depth of the wound, killing these vicious pests, ejecting them from the injured area and aiding the natural processes of healing.

Who doesn't remember the development of Smear 62? In recent years more modern screwworm remedies have come along, but it was the original old "62" that came to light in the late '30's and gave the stockman his first real weapon against that revolting scourge of the rangeland, the screwworm!

But this chemical which has run the gamut from explosives to screwworms, a character with the involved moniker of diphenylamine, has in the meantime been under scrutiny by other investigators. It has been reacted chemically with sulfur to make a product known as phenothiazine.

### A New Insecticide

For years, farmers have been depending on lead arsenate, other arsenicals, nicotine, fluorine compounds, and other old-line products as insecticides -- using them to protect fruit and vegetable crops from the insect hosts that prey upon them. But at the time of our story, early in the 1930's, the Food and Drug Administration has become alarmed about the amount of poisonous residue these insecticides are introducing to the human diet. Federal tolerances are

established, setting the maximum amount of insecticide which can be present on harvested crops. If this amount is exceeded, crops will be condemned.

Faced with this critical problem, the chemical industry is testing many compounds in a search for a new insecticide which will not present the residue hazards of lead arsenate. One of these products, tested by its formulator, the Du Pont Company, is this same phenothiazine. It shows remarkable promise and in the late '30's is offered to growers -- a forerunner of the modern era of organic insecticides which has seen the development of those bug killers DDT, methoxychlor, BHC and many others.

But once again, the USDA's Bureau of Animal Industry is working on a knotty livestock health problem. Intestinal worms and other internal parasites have become a road block in the path of increased livestock production. Moist, humid conditions, present in pastures, offer an ideal medium for the development of worm larvae, hatched from eggs in the droppings of parasitized stock. Grazing cattle, sheep, and horses pick up these tiny larvae with their feed and in an alarmingly short time the parasitic level builds up to a stage where intestines and stomach walls are clumped with masses of writhing, ravenous worms, attaching themselves to tissues from which they can suck blood or otherwise take nourishment from their four-footed host. Adult animals under such an onslaught become emaciated, mere bags of bones. Calves, lambs, and colts in heavily infested pastures are unable to survive.

#### Fatal to Internal Parasites

Workers in the USDA's zoological division try phenothiazine as a drug to be taken internally for the control of these parasites. Their results are startling. Heavily parasitized stock, after treatment, expel masses of dead worms, then with ravenous appetite begin to feed and restore their debilitated tissues, to make gains, to bloom back into health again. Sheep raising in the Southwest particularly becomes dependent on phenothiazine.

Stockmen greet this discovery as one of the greatest advances in the history of their business. Particularly in southern states, sections where livestock growing had been slowed to a walk by competition of the parasites, pasture acreage and livestock numbers begin to climb. The demand for phenothiazine pyramids far beyond the early channels of supply.

Over the years, more know-how with phenothiazine accumulates. Once stock are purged of these gross masses of parasites, techniques of feeding small amounts of the drug in daily rations are worked out to avoid reinfestation.

Such is the moving panorama presented by development of a single chemical compound -- one among the thousands which were formulated the same year in which diphenylamine first saw the light of day. Of those thousands of new compounds synthesized in the laboratory each year, only a handful ever find some useful application. Such is the gamble of research -- the long-shot chance that once in the collective careers of a team of scientists they will come up with a diphenylamine, which in turn may contribute to a phenothiazine -- stepping stones toward a more abundant life!

These are chapters from the chemical log book of the Du Pont Company -- incidents piled on incidents which have led this 150-year-old firm into a position of close cooperation with stockmen. They parallel similar developments in the laboratories, experimental farms, and research organizations of a number of American chemical and biological enterprises.

#### New Laboratory Now In Use

Sometime this coming winter(\*) a group of biological scientists will occupy a new laboratory, built on an old farmstead which straddles the Delaware-Maryland border, near Newark, Delaware. More than two and a half million dollars will have gone into the buildings and their modern laboratory equipment -- testimony of the importance Du Pont places on the development of future tools to help the stockman maintain the health of his animals.

But how did this company, established to manufacture gunpowder and now diversified into the production of more than 1200 lines, become interested in agriculture and the problems of the livestock grower?

Let us go back to the days of World War I. Submarine blockades have literally lowered the curtain on transatlantic shipping and our supplies of many of the goods for which the New World depended on the Old World. Among these are dyes.

The Du Pont Company, flooded with wartime emergency work, nevertheless sets up a research project in dye formulations. Failures are frequent as these American chemists work long hours to unravel the secrets of dye making. More than \$40,000,000 has been invested in the project before there is any return on that investment. But our nation has severed its chain of dependence on the European dye industry. We can now produce dyes to equal any of the importations.

In developing this know-how in dye production, a particular quintet of scientists have been made a part of the Du Pont research family. No one of these men would join the staff without the others, due to their long association in other research laboratories. Four of them are experts in the field of dyes. The fifth, Dr. Max Englemann, has been engaged in studying the chemical treatment of seed, affording protection against diseases on the seed coat and in the soil which may rot the seed or kill the tiny seedling.

#### Seed Disinfectants First

At Du Pont, Dr. Englemann is not asked to transfer his efforts to some more industrial project. His abilities and knowledge in this complex field are recognized and as a result of his experimental work the company develops its first direct contact with the agricultural trade. The "Ceresan" and "Arasan" seed disinfectants of today which help growers produce better stands of grain, vegetable

(\*) Since this story appeared in The Corn Belt Farm Dailies, the laboratory buildings have been completed, and are now in use. This is the Stine Laboratory of the Grasselli Chemicals Department.

crops, hay, and even pasture grasses, bear witness to the firm foundation on which this research is laid.

But there are other factors. Several chemical companies, already active in the agricultural field, become a part of the Du Pont Company. Two of these are the Grasselli Chemical Co., acquired in 1928 and which later becomes the Grasselli Chemicals Department of Du Pont, and Acetol Products, Inc., which Du Pont acquired in 1931.

This last company has become a factor in the poultry industry at the time of its joining with Du Pont. Best known of its products is "Cel-O-Glass" plastic-coated wire mesh, a sheeting which allows the health giving ultra-violet rays in sunlight to pass through.

Meantime, in the "roaring '20's" Dr. Harry Steenbock of the University of Wisconsin has been at work investigating the origin of Vitamin D. He finds it can be synthesized from yeast through irradiation with ultra-violet light -- a startling development because it provides a source of this growth and vitality-producing, and disease-resistance vitamin, for the feeding of both livestock and humans.

Prior to joining Du Pont, Acetol Products, Inc. has been licensed by the Wisconsin Alumni Research Foundation for the production of Vitamin D in the field of poultry nutrition. The first type of Vitamin D, produced by irradiating sterols from yeast and other vegetable sources, is not as effective on poultry as the Vitamin D found in fish liver oils. This first type is later identified as Vitamin D<sub>2</sub> and its failure in poultry nutrition leads to a new process. Based on research work, both here and in Europe, sterols, extracted from the meat of mussels (the elliptical shellfish found in abundance on many coasts) are irradiated with ultra-violet light to form an entirely new Vitamin D. For poultry, this new Vitamin D proved to be just as effective as the Vitamin D present in fish liver oils. It is identified as Vitamin D<sub>3</sub>.

Today this Vitamin D<sub>3</sub> business finds both its source and its market in the livestock field. Several of the leading packing companies produce cholesterol from the spinal cords of beef cattle. Du Pont makes use of this source in the production of "Delsterol" Vitamin D<sub>3</sub> as a feed additive. Used primarily in poultry feeds, "Delsterol" is also finding a place in pet food, for the Vitamin D fortification of evaporated milk, and in many other nutritional fields.

#### And Now Urea

Meantime, still another department of the Du Pont operation has found itself in the livestock picture. Ammonia production for industrial uses has long been a mainstay of the Polychemicals Department. From ammonia, it is but a step to the production of urea. Here, from the very air we breathe and the water we drink has come a potent source of nitrogen -- and nitrogen is the essential element in protein.

Backed by their own research and experimental results from other parts of the world, Du Pont scientists begin to experiment with the addition of urea

formulations to livestock feeds. Their work creates a stir in the feed industry for it is found that urea can improve the utilization of roughages, such as cobs, fodder, etc. by cattle and sheep and a ration produced which will result in highly economical gains for the feeder.

A product is formulated known as "Two-Sixty-Two" feed compound. For the feeding of ruminant animals -- cattle, sheep, and goats -- this synthetic material can effectively replace up to a third of the natural proteins required in the ration. It is made available only to feed mixers since care is required in blending it into the mix.

Yet perhaps the most dramatic story in modern livestock health work is to be found in the field of controlling insects and other external parasites. For the start of this epic, let's go back to 1874 and look over the shoulder of a German scientist named Othmar Zeidler. He is writing up an experiment which he has just completed, and which resulted in synthesizing a new chemical compound -- dichlorodiphenyltrichloroethane!

Those notes, along with other notes on Zeidler experiments, are destined to gather dust until the 1930's, when they are dusted off by the Geigy Co. of Switzerland. It is found that this compound has unsuspected qualities as an insecticide. Now dichlorodiphenyltrichloroethane becomes DDT, and is sold in Europe as a moth-proofing material!

A troublesome American visitor plays the next role in our drama -- the Colorado potato beetle! Swiss crops are being overrun. A Geigy investigator tries their moth-killing DDT in a farmer's field. The results are startling, for not only do the beetles die, but fresh invaders continue to die for weeks after a single application.

By this time, American GI's are going overseas by the shipload. Armed forces medical officers are seeking an insecticide to protect the health of troops from vermin and disease-spreading bugs of South Pacific islands and bombed-out towns in southern Europe and northern Africa. They see demonstrations with DDT and know they have found the answer. Now they must develop an adequate source of supply. Arrangements are made for an American producer, the Du Pont Company, to go into production of this wartime essential.

Farmers and stockmen must wait until hostilities are over to taste of the insect control now possible with DDT. And in the meantime other potent new insecticides in the same chemical family -- chlorinated hydrocarbons -- have been developed. We begin to know them by their common names -- BHC, methoxychlor, lindane, chlordane -- and to know the uses for which each is best adapted.

#### Fleas Are Pesky

Stockmen have long known that flies are an expensive pest. The rate of gain in beef stock on pasture falls off rapidly when fly season arrives. Dairymen can watch their milk production drop, even as they watch their cows running tail in air, tossing their heads, bedeviled by flies when they should be grazing.

Now, with these modern insecticides to provide residual control of flies, for the first time it is possible to measure the actual cost of these pests to the producer. Comparisons between sprayed and unsprayed groups of cattle show that more than 50 pounds of weight in a two-month period are sacrificed if cattle are not protected by insecticides. Horn flies alone can cost the dairyman from five to twenty per cent of his summer milk check.

At the outset, DDT is used for virtually every pest problem. Then we discover that we must know more about some of these new compounds than merely how well they kill insects. In the case of dairying, DDT is found to be secreted in the milk and stored in body tissues. And in the beef operation, DDT is also present in body tissues if it has been applied within 60 days of slaughter.

So in 1949, Food and Drug Administration announces that DDT should not be used for fly control in dairy barns, or on dairy cattle. But in the same breath, stockmen are informed that the American chemical industry has solved this problem in advance. The solution is methoxychlor!

#### Another New One

Early in the 1940's, methoxychlor is synthesized in a Du Pont laboratory. It receives only limited testing during the war years. But the results point to this material as a forerunner of a new era in pest control. Here is a chemical which is only about one twenty-fourth as toxic to warm-blooded animals as DDT, yet almost equally effective in killing insects. Not only can it be used around dairy premises and on dairy animals without the insecticide being stored in the flesh or secreted in the milk of the cattle, but it can be used by fruit and vegetable growers close to harvest time without leaving dangerous amounts of residue on crops. Hay fields and pasturelands can be sprayed to halt insect damage, without contamination of these sources of feed.

Today, methoxychlor is the only long-lasting insecticide recommended by the USDA for direct application to dairy cattle. Dairymen secure it generally as a wettable powder containing 50 per cent active methoxychlor and known simply as Dairy Cattle Spray, although an oil emulsion containing this chemical has also been approved recently for use on stock. While this wettable powder is also approved for use to control flies in barns, Du Pont chemists have worked out a combination of methoxychlor and lindane which they call by the equally descriptive name of Dairy Barn Insecticide -- especially for fly control in barns where other insecticides have not given satisfactory results.

#### A Cattle Industry Saved

When certain pests move into an area, the cattle industry can move out fast if no solution is at hand. Look at Florida in 1948. An outbreak of Texas cattle fever tick is reported first in one county, then in another, until practically every livestock county in the state is under quarantine. Cattle cannot be shipped. Cattlemen talk of selling out.

It is in such a critical situation that another Du Pont combination of insecticides meets its first test. Livestock Spray and Dip No. 30, it is called --

a combination of DDT and BHC. Here it proves itself by helping to clean up the tick infestation in record time, for only one dipping is required to kill all ticks on infested cattle. This makes it possible to eliminate the holding period formerly required following dipping in arsenicals, and to extend the time between dippings from two to three weeks.

Today this combination of DDT and BHC is recommended in every Gulf Coast state, and in many other cattle growing areas of the world.

#### Licking the Scab Mite

It is the Fall of 1951 and another pest is playing havoc with the marketing of sheep in West Texas. This villain is sheep scabies -- the work of the scab mite. Fleeces with moth-eaten appearance, loose gobs of wool hanging from the animals, raw spots on the bare hide where sheep have rubbed in vain attempt to assuage the horrible itching -- all attest to the devastation these almost microscopic burrowers can produce in a flock.

Shipments into other states have been stopped. There seems no fast method of cleaning up those scabby flocks, for the old approved remedy is a dipping in a vat of lime sulfur, heated to around 100 degrees Fahrenheit and sometimes combined with nicotine sulfate; then a holding period of two weeks and another treatment.

Yet here again modern chemicals come to the rescue. A 10%-gamma wettable powder of BHC -- "Lexone" LOGW insecticide -- has been tested the year before for a minor outbreak of scabies in the middle-west. Research data are scanned. By dipping or spraying, with no heating of the solution required, one application of this insecticide has given 100 per cent control!

Vats are charged with the BHC preparation. Sheep are dipped and livestock sanitary inspectors, anxious to assure themselves of the effectiveness of this new treatment, inspect the sheep. There is no doubt of it. This BHC does the job, and in a matter of a few weeks Texas sheep are again in transit!

#### Much to Learn

We stand on the threshold of a broadening alliance between the chemist and the stockman. "Antibiotics" is now a new word in our vocabulary. Amino acids, component parts of protein, are being unveiled, as witness the revolutionary new synthetic production of methionine -- an essential amino acid now available to fortify feeds.

From laboratories all over the country new methods of keeping herds and flocks healthy and productive may revolutionize livestock husbandry in the years ahead.

## EQUALITY OF OPPORTUNITY DESIRED BY ALL ELEMENTS

A new administration in Washington provides American business and industry with "an opportunity" for constructive action but presents heavy national responsibilities, a Du Pont Company executive said recently in Wilmington.

Donald F. Carpenter, general manager of the Du Pont Film Department, told members of the Manufacturers' Section, Chamber of Commerce of Delaware, that business now hopes to have a government "characterized by integrity and fairness." He warned, however, that business "will be distinctly on probation."

Business expects no special favors from the new administration, but hopes for "fairness to all elements of society, whoever and wherever they may be," Mr. Carpenter added.

Business makes only one request of the new administration, he said. "Give us equality of opportunity and let us show you what we can do for this glorious country of ours. Let us practice the free enterprise system and let it demonstrate again what miracles it can perform for all Americans. Let us also say, however, that if we are granted this request, we will pledge, in turn, not to abuse our opportunity."

### Time For Statesmanship

"It is now time for us to show our statesmanship. We must not change from the hunted animal to the devouring beast -- but rather we must emerge from behind the tree confident that we will not be fired upon by the first government agency that spots us. We must quietly, sincerely, and energetically carry on our duties like the true domesticated animal -- the beast of burden if you like, but the servant of our country."

Referring to attacks on business, Mr. Carpenter said, "For 20 long years we have been looked upon with suspicion. We have been blamed for the depression of the 30's, and the recession of '38. For unemployment, for poverty, for building plants at government expense. For conspiracy of all kinds. For overproduction and underproduction, for technological achievements which threw men out of work and for lack of technological advancement. For monopoly and for failure to work together, for sinister planning and lack of foresight, and on and on."

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Better Things for Better Living  
... through Chemistry